THAT WHICH IS CLAIMED:

1. A dual frequency antenna, comprising:

a plurality of dipole antennas configured to receive signals having first and second frequencies, and being arrayed to an effective length to reradiate signals at a third frequency, the third frequency being the difference between the first and second frequencies; and

a plurality of nonlinear resonant circuits, each nonlinear resonant circuit interconnecting at least two of the plurality of dipole antennas and configured to permit reradiation of signals having the third frequency over the effective length.

2. The dual frequency antenna according to claim 1, wherein each of the plurality of dipole antennas comprises a half wavelength dipole.

3. The dual frequency antenna according to claim 1, wherein each of the plurality of dipole antennas comprises an electric dipole.

4. The dual frequency antenna according to claim 1, wherein each nonlinear resonant circuit comprises at least one reactive circuit element.

5. The dual frequency antenna according to claim 4, wherein the at least one reactive circuit element comprises an inductive circuit element interconnecting the at least two of the plurality of dipole antennas.

6. The dual frequency antenna according to claim 5, wherein the inductive circuit element comprises a looped conductor.

7. The dual frequency antenna according to claim 4, wherein the at least one reactive circuit element comprises a capacitive circuit element interconnecting the at least two of the plurality of dipole antennas.

8. The dual frequency antenna according to claim 7, wherein the capacitive circuit element comprises a parallel plate capacitor.

9. The dual frequency antenna according to claim 1, wherein each nonlinear resonant circuit comprises at least one nonlinear circuit element interconnecting the at least two of the plurality of dipole antennas.

10. The dual frequency antenna according to claim 9, wherein the nonlinear circuit element comprises a diode.

11. The dual frequency antenna according to claim 1, wherein each dipole antenna is configured to receive signals having the first and second frequencies which are millimeter wave frequencies.

12. A method of down-converting at least first and second electromagnetic radiation frequencies:

transmitting a first electromagnetic beam at a first frequency;

transmitting a second electromagnetic beam at a second frequency offset from the first frequency by a difference frequency;

receiving the first and second electromagnetic beams with at least two dipole antennas;

converting the first and second frequencies to the difference frequency through a nonlinear resonant circuit coupling the at least two dipole antennas; and

transmitting an electromagnetic beam at the difference frequency from the coupled at least two dipole antennas.

13. The method according to claim 12, wherein the step of transmitting a first electromagnetic beam comprises transmitting in a first direction; the step of transmitting a second electromagnetic beam comprises transmitting in a second direction; and the step of receiving is performed in an intersection of the first and second electromagnetic beams.

14. The method according to claim 12, wherein the steps of transmitting further comprise combining the first and second electromagnetic beams in a common direction.

15. The method according to claim 12, wherein the steps of transmitting further comprise combining first and second electromagnetic beams through a polarization beam combiner.

16. The method according to claim 12, wherein the steps of transmitting first and second electromagnetic beams comprises transmitting first and second electromagnetic beams having a common polarization.